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AN EXPLORATORY STUDY OF CONTRACTING PERFORMANCE BY UNTRAINED INDIVIDUALS

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An Exploratory Study of Contracting Performance by Untrained Individuals

Presenter: Ned Kock is Associate Professor and Chair of the Department of MIS and Decision Science at Texas A&M International University. The National Science Foundation and the Department of Defense, through its External Acquisition Research Program, have funded his research. He holds degrees in electronics engineering (B.E.E.), computer science (M.Sc.), and management information systems (Ph.D.). Ned has authored several books, and published in a number of journals including *Communications of the ACM*, *Decision Support Systems*, *IEEE Transactions on Education*, *IEEE Transactions on Engineering Management*, *IEEE Transactions on Professional Communication*, *Information & Management*, *Information Systems Journal*, *Information Technology & People*, *Journal of Organizational Computing and Electronic Commerce*, *Journal of Systems and Information Technology*, *MIS Quarterly*, and *Organization Science*. He is the Editor-in-Chief of the *International Journal of e-Collaboration*, Associate Editor of the *Journal of Systems and Information Technology*, and Associate Editor for Information Systems of the journal *IEEE Transactions on Professional Communication*. His research interests include action research, ethical and legal issues in technology research and management, e-collaboration, and business process improvement.

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Abstract

This paper reports on an experimental study where 178 student subjects without formal training in contracting issues were asked to accept or reject each of 20 clauses of a software purchasing contract. The subjects used a Web-based interface to accept or reject clauses. Of the 20 clauses in the contract, 6 were intentionally deceitful, in the sense that they specified binding obligations that made it unadvisable to accept them as part of a contract. On average, the subjects were able to correctly accept approximately 11 out of 14 non-deceitful clauses. Somewhat surprisingly, the subjects were able to correctly reject only 2 out of 6 deceitful clauses. The study also suggests that, among untrained individuals, those who are older, have more general work experience, and have above-average scholastic ability are the ones more likely to perform well in contracting tasks under conditions similar to those found in this study (i.e., Web-based contracting conditions). This study's findings provide the basis for a strong call for more and better training of contract officers in the DoD.

KEYWORDS: Electronic Commerce, Electronic Trade, Web-based Contracts, Software Purchasing, Communication Media, Media Naturalness

Introduction

Recently there have been renewed calls (see, e.g., Friar, 2005) for more and better training of contract officers in the US Department of Defense (DoD). Without appropriate training, serious contractual mistakes may be made, some of which are likely to place the DoD in a situation where it is legally bound to abide by adverse contract clauses. Given the large dollar amounts involved in many of the DoD's contracts, the financial consequences of such mistakes can be significant.

Several technological developments in the last 20 years led to a significant growth in the number of instances of situations in which products and services are purchased online. Among those technological developments were the emergence of the Internet in the early 1990s, and the advent of the Web in the mid-1990s (Claycomb et al., 2005). Most online transactions that involve the purchase of products and services go through the reviewing, completion, and signing of a Web-based contract (Atkins, 2003; Backhouse and Cheng, 2000). That process usually gravitates around the acceptance or rejection of Web-based contract clauses.

This paper empirically illustrates the problems associated with having individuals lacking proper training accept or reject contract clauses. It reports on an experimental study where a number of individuals without formal training in contracting issues were asked to accept or reject each of 20 clauses of a software purchasing contract. The clauses were developed based on a several sources, including existing commercial software contracts and the "Software Legal Book". The latter is a study conducted by the Society of Information Management on industry practices associated with software contracting.

Research method

The study involved 178 student subjects, of whom approximately 57 percent were males. The subjects' ages ranged from 18 to 53 years of age, with a mean of 25 years. Their work experience ranged from 0 to 35 years, with a mean of 5.6 years. Their class levels ranged from 1 to 5; the levels represented in this study were: 1 (freshman), 2 (sophomore), 3 (junior), 4 (senior), and 5 (graduate). The mean class level of the subjects was 3.3.

The subjects used a Web-based interface to accept or reject clauses. Of the 20 clauses in the contract, 6 were intentionally deceitful, in the sense that they specified binding obligations that made it unadvisable to accept them as part of a contract. Those 6 clauses were perceived as obviously deceitful by a panel of experts and professionals trained on contracting issues who were asked to review all of the clauses. From a practical perspective, correctly rejecting deceitful clauses can be seen as more critical than correctly accepting non-deceitful clauses.

The measurement model included three latent variables measured based on perceptions. These latent variables were: cognitive, or mental, effort; communication ambiguity; and dullness. Perceived cognitive effort is sometimes referred to here as COGEFF, perceived communication ambiguity as AMBIGU, and perceived dullness as DULL. Each latent variable was measured through multiple indicators. The question-statements related to each of the indicators are listed in the Appendix.

The relationship between latent variables and other variables was assessed through structural equation modeling employing that partial least squares (PLS) technique (Chin et al., 1996; Chin, 1998). The structural equation modeling analyses included two demographic variables as independent and intervening variables, namely age and work experience, respectively. The analyses also controlled for the effects of several demographic variables, namely: communication medium (text-based or video clip-based clauses shown on a Web browser), gender, scholastic aptitude (GPA), and class level (from freshman to graduate).

Results

Table 1 shows factor loadings obtained through a factor analysis. The extraction method used in the factor analysis was principal components, and the rotation method employed was varimax. Shown in shaded cells are the loadings for the indicators that were conceptually expected to load on their related latent constructs (e.g., COGEFF1 … COGEFF4 were expected to load on COGEFF). Also shown on Table 1 are Cronbach alphas for each of the latent constructs, in the column labeled “Alpha”, and the corresponding composite reliabilities, in the column labeled “CR”.

Table 1: Factor loadings and alpha coefficients

	COGEFF	AMBIGU	DULL	Alpha	CR
COGEFF1	.76	.39	-.02	.82	.88
COGEFF2	.80	.35	.00		
COGEFF3	.76	.25	.15		
COGEFF4	.74	.02	.07		
AMBIGU1	.36	.76	.18	.87	.92
AMBIGU2	.19	.88	.11		
AMBIGU3	.23	.85	.18		
DULL1	.09	.13	.91	.91	.94
DULL2	.07	.14	.90		
DULL3	.03	.13	.92		

Notes:

COGEFF = cognitive, or mental, effort

AMBIGU = communication ambiguity

DULL = dullness

Alpha = Cronbach alpha coefficient

CR = composite reliability from PLS analysis

The convergent validity of a measurement model used in structural equation modeling can be assessed based on the comparison of indicator loadings expected to lead on each of the respective latent constructs against a recommended threshold loading, which is generally .5 (Hair et al., 1987). For this study, the indicator loadings in question are the ones shown in the shaded cells in Table 1. They range from .74 to .92, suggesting that the measurement model presents an appropriate level of convergent validity.

Another important attribute of a measurement model is its reliability, which can be assessed through measures such as Cronbach alpha and composite reliability coefficients. As with convergent validity analysis, the determination as to whether a measurement model has good reliability hinges on the comparison of reliability measures with a recommended threshold. That threshold is generally .7 (Nunnaly, 1978). As it can be seen in the columns labeled “Alpha” and “CR” of Table 1, all Cronbach alpha and composite reliability coefficients are higher than .82. This leads to the conclusion that the measurement model employed presents an appropriate level of reliability.

Table 2 shows the one-on-one correlations between the latent constructs, as well as the average variances extracted for each latent construct – the latter are shown on the diagonal, within parentheses. Also shown are the means and standard deviations for each of the constructs. The correlation coefficients shown were calculated based on Pearson's method, and refer to bivariate rather than partial correlation estimations. All of the correlations shown are significant at the .05 level (marked with "*") or at the .01 level (marked with "**").

Table 2: Correlations, AVEs, means and standard deviations

	COGEFF	**AMBIGU**	**DULL**
COGEFF	(.65)		
AMBIGU	.58**	(.79)	
DULL	.17*	.32**	(.85)
Mean	4.15	4.14	3.96
SD	1.16	1.20	1.28

Notes:

Coefficients shown are Pearson correlations, and average variances extracted (diagonal)

COGEFF = cognitive, or mental, effort

AMBIGU = communication ambiguity

DULL = dullness

SD = standard deviation

** = correlation significant at the .05 level*

*** = correlation significant at the .01 level*

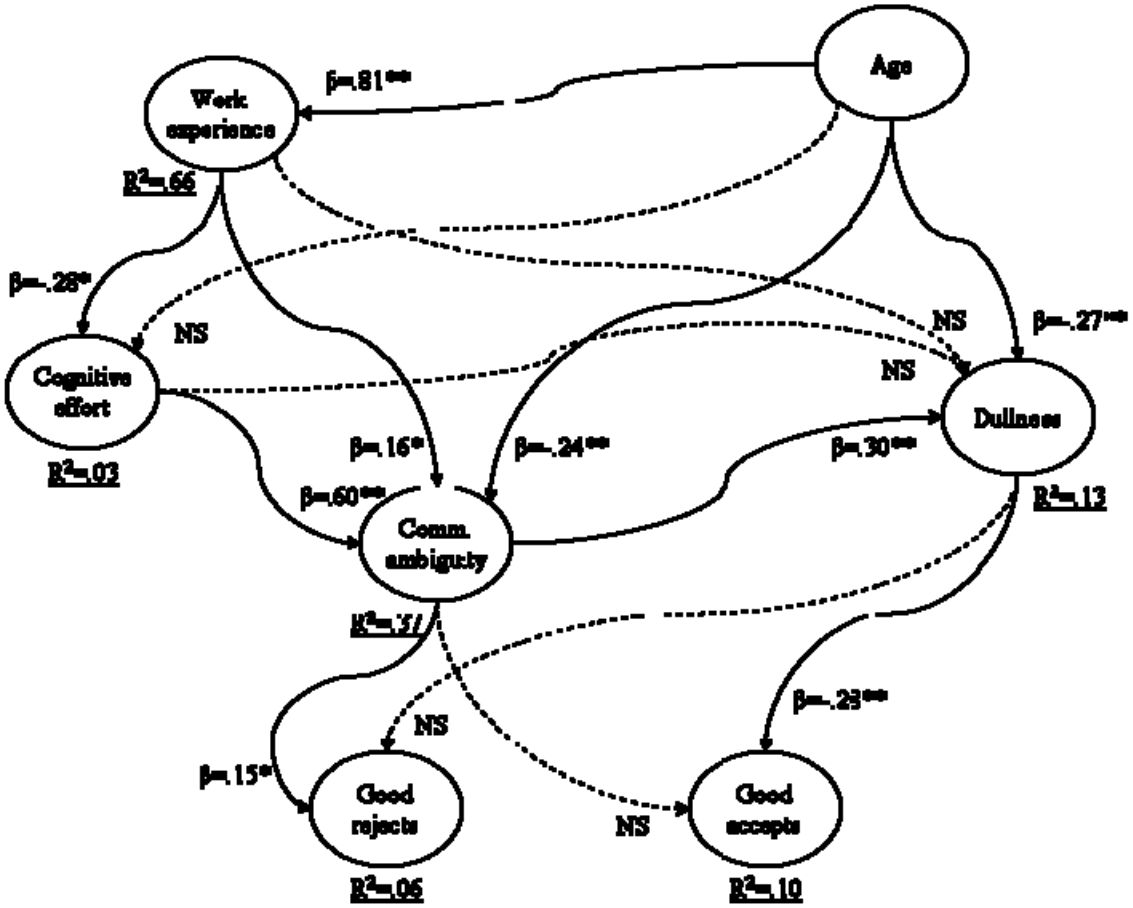
One final attribute that is often assessed for a measurement model based on latent constructs is the discriminant validity of the model. This attribute can be assessed based on the comparison of the correlations between the latent constructs and their individual average variances extracted (Fornell & Larcker, 1981). Here, a conservative criterion that can be used to assess discriminant validity is to check whether the average variance extracted for each latent construct is higher than any of the correlations involving the construct in question. As it can be seen from Table 2, all of the average variances extracted (shown on the diagonal) are higher than the correlations displayed below them or to their left. Therefore, it can be concluded that the measurement model presents an appropriate level of discriminant validity.

Now that it has been established that the measurement model has appropriate validity and reliability, it is possible to conduct a meaningful structural equation modeling analysis of the relationships between several of its variables. The results of one such analysis are shown in

Figure 1. There, several variables are shown within ovals. Curved arrows connecting variables depict causal relationships tested through the structural equation modeling analysis. Dotted arrows indicate relationships that are not statistically significant; full arrows indicate statistically significant ones.

The β coefficients near the full arrows in Figure 1 refer to the partial correlations associated with the significant relationships. Dotted arrows have the letters "NS" (not significant) shown instead of β coefficients. The β coefficients displayed are followed by the symbols "*" or "**", which indicate significance levels – .05 or .01, respectively. The R^2 coefficients shown under each endogenous (i.e., dependent) variable indicate the percentage of explained variance provided by the model for that particular variable.

Figure 1: Structural equation model and estimated parameters



Notes:

Good accepts = number of non-deceitful clauses accepted

Good rejects = number of deceitful clauses rejected

β = partial correlation coefficient associated with a causal link in the model

R^2 = variance explained by the model for a particular endogenous variable

** = causal link significant at the .05 level*

*** = causal link significant at the .01 level*

NS = causal link not significant

As it can be seen from Figure 1, age appears to have a strong relationship with work experience (β=.81, P<.01), which is to be expected since older individuals usually have more work-related experience than younger ones. The relationship between age and perceived dullness was also significant, although negative (β=-.27, P<.01). That is, older individuals seemed to perceive the task of accepting or rejecting contract clauses as less boring than younger individuals. Age seemed to also be significantly and negatively related to perceived communication ambiguity (β=-.24, P<.01), which means that older individuals seemed to perceive the contract clauses as less confusing than younger individuals. Age was not significantly related to perceived cognitive effort.

Work experience appears to have a significant and negative relationship with perceived cognitive effort (β=-.28, P<.05), which suggests that individuals with more work experience tended to perceive the task of accepting or rejecting clauses as less complex and mentally demanding than individuals with less work experience. The relationship between work experience and perceived communication ambiguity was also significant, although positive (β=.16, P<.05), which means that individuals with more work experience were inclined to perceive the contract clauses as more confusing than younger individuals. Work experience was not significantly related to perceived dullness.

The degree of cognitive effort perceived by the subjects seems to have a strong and positive relationship with perceived communication ambiguity (β=.60, P<.01). That is, individuals who perceived the task of accepting or rejecting clauses as more complex and mentally demanding also perceived the contract clauses as more confusing. Perceived cognitive effort was not significantly related to perceived dullness.

Perceived communication ambiguity appears to be significantly related to perceived dullness (β=.30, P<.01), which essentially means that individuals who perceived the contract clauses as more confusing also perceived the task of accepting or rejecting contract clauses as more boring. There seemed to also be a significant relationship between perceived communication ambiguity and number of appropriate rejections of deceitful clauses (β=.15, P<.05), noted as “good rejects” in Figure 1. In other words, individuals who perceived the contract clauses as more confusing also did better in terms of rejecting deceitful clauses. Perceived communication ambiguity was not significantly related to the number of appropriate acceptances of non-deceitful clauses.

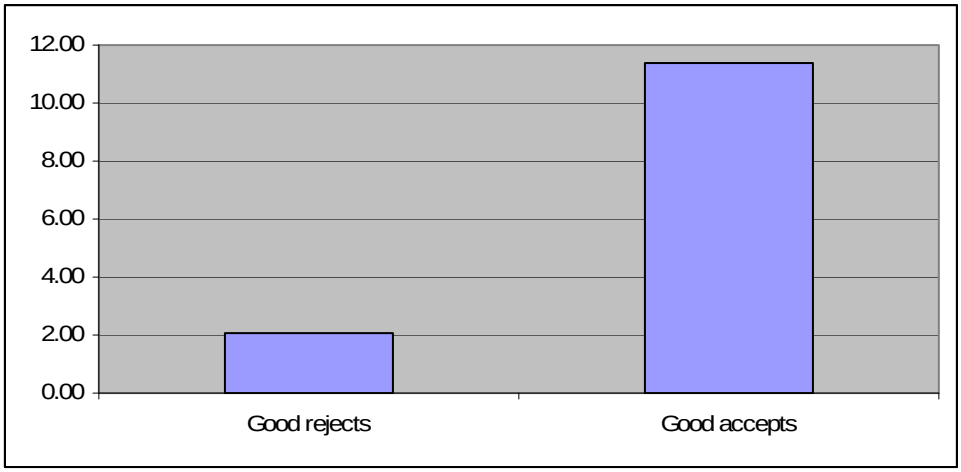
Perceived dullness seems to be significantly and negatively related to the number of appropriate acceptances of non-deceitful clauses (β=-.28, P<.01). This suggests that individuals who perceived the task of accepting or rejecting contract clauses as more boring also did worse in terms of appropriately accepting non-deceitful clauses. Perceived dullness was not significantly related to the number of appropriate rejections of deceitful clauses.

Not shown on Figure 1 are the control variables, which were included in the model as independent variables pointing at the two main dependent variables of the model – namely good rejections and acceptances. Those control variables were communication medium (text-based or video clip-based clauses shown on a Web browser), gender, scholastic aptitude (GPA), and class level (from freshman to graduate). None of those variables had a statistically significant effect on either of the two main dependent variables of the model.

Figure 2 shows a bar chart depicting the average numbers of appropriate rejections of deceitful clauses (i.e., “good rejects”), and of appropriate acceptances of non-deceitful clauses

(i.e., “good accepts”). Since each clause could either be rejected or accepted, and there were 6 deceitful clauses, the average number of rejections of deceitful clauses obtained by chance would be 6 divided by 2, or 3. That is, if all individuals had accepted or rejected clauses randomly, the average number of good rejects would be 3. Similarly, since the number of non-deceitful clauses was 14, the average number of good accepts obtained by chance would be 7.

Figure 2: Average numbers of good rejections and acceptances



Notes:

Good rejects = number of deceitful clauses rejected

Good rejects obtained by chance = 3

Good accepts = number of non-deceitful clauses accepted

Good accepts obtained by chance = 7

As it can be seen from Figure 2, the individuals participating in this study generally did worse than chance in terms of appropriately rejecting deceitful clauses, as the average number of good rejects was a little over 2 (to be more precise, it was 2.07). The standard deviation for good rejects was 1.41. Therefore, the average number of good rejects was approximately two thirds of a standard deviation lower than the number of chance good rejects; a difference large enough to be considered statistically significant given the sample size and data distribution in this study.

It can also be inferred from Figure 2 that the individuals did better than chance in terms of good accepts, or in terms of appropriately accepting non-deceitful clauses, as the average number of good accepts was a little over 11 (11.38, to be more accurate). The standard deviation for good accepts was 2.44, which means that the individuals’ performance in terms of accepting non-deceitful clauses was 1.79 standard deviations above the chance performance. This is not only statistically significant, but also a relatively large difference in statistical terms.

Discussion and conclusion

On average, the subjects were able to correctly accept approximately 11 out of 14 non-deceitful clauses. Somewhat surprisingly, the subjects were able to correctly reject only about 2 out of 6 deceitful clauses. It is no exaggeration to say that a monkey trained to mindlessly accept or reject those deceitful clauses would have performed better than this study's subjects, since that monkey would have on average rejected 50 percent (or 3) of the 6 deceitful clauses. That is, on average the subjects performed worse than chance in terms of rejecting deceitful clauses.

The study also looked into the relationship between the ability to correctly accept or reject clauses and three key perceptual latent variables: cognitive (or mental) effort, communication ambiguity (or confusion), and dullness (or boredom). The degree of perceived communication ambiguity was, somewhat surprisingly, positively correlated with the ability to correctly reject deceitful clauses (perhaps because the sense of ambiguity led subjects to be more alert to deceit). The degree of perceived dullness experienced by the study subjects was negatively correlated with the ability to correctly accept non-deceitful clauses (i.e., bored individuals seemed more likely to reject acceptable clauses). Perceived cognitive effort was strongly and positively related to perceived communication ambiguity (i.e., mentally drained individuals seemed more likely to fell confused by the clauses), but not to perceived dullness.

Both demographic variables included in the model as independent and intervening variables, namely age and work experience, had statistically significant effects on other variables. The study suggests that age is negatively related to perceived communication ambiguity and dullness (i.e., older individuals experienced less confusion and boredom while going through contract clauses). It also suggests, somewhat intuitively, that work experience is negatively related to perceived cognitive effort (i.e., subjects with more work experience felt less mentally "drained" by the task). Additionally, the study suggests that age is positively related to work experience, as one would expect.

This study's findings provide the basis for a strong call for more and better training of contract officers in the DoD. Those findings also suggest that, among untrained individuals, those who are older and have more general work experience are the ones more likely to perform well in contracting tasks under conditions similar to those found in this study (i.e., Web-based contracting conditions). Finally, this study suggests exciting new avenues for research on contracting issues, particularly in connection with deceit identification in contracts. Untrained individuals seem fairly unable to identify deceit, even in cases where trained individuals would perceive it as obvious.

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